

HW-1

1.2) Given $x_1[n] = \delta[n] - 2\delta[n-1]$

$$x_2[n] = 2\delta[n] + \delta[n-1] - \delta[n-2]$$

$$x[0] = 1$$

$$x_1[n] = [1, -2, 0, 0]$$

$$x[1] = -2-j$$

$$x_2[n] = [2, 1, -1, 0]$$

$$x[2] = 7$$

$$x[3] = -2+j$$

1) Linear Convolution $x_1[n] * x_2[n]$

$$\begin{array}{r|rr} & 1 & -2 \\ 2 & 2 & -4 \\ 1 & 1 & -2 \\ -1 & -1 & 2 \end{array}$$

$$y[n] = [2, -3, -3, 2]$$

2) Compute 4 point DFT $X_1[k] = \text{DFT}\{x_1[n]\}$ and $X_2[k] = \text{DFT}\{x_2[n]\}$

X_1

$$X_1[0] = (1 \times 1) + (-2 \times 1) + (0 \times 1) + (0 \times 1) = -1$$

$$X_1[1] = (1 \times 1) + (-2 \times -j) + (0 \times -1) + (0 \times j) = 1 + 2j$$

$$X_1[2] = (1 \times 1) + (-2 \times -1) + (0 \times 1) + (0 \times -1) = 3$$

$$X_1[3] = (1 \times 1) + (-2 \times j) + (0 \times -1) + (0 \times -j) = 1 - 2j$$

$$X_1[\text{DFT}] = [-1, 1+2j, 3, 1-2j]$$

X_2

$$X_2[0] = (2 \times 1) + (1 \times 1) + (-1 \times 1) + (0 \times 1) = 2$$

$$X_2[1] = (2 \times 1) + (1 \times -j) + (-1 \times -1) + (0 \times j) = 3 - j$$

$$X_2[2] = (2 \times 1) + (1 \times -1) + (-1 \times 1) + (0 \times -1) = 0$$

$$X_2[3] = (2 \times 1) + (1 \times j) + (-1 \times -1) + (0 \times -j) = 3 + j$$

$$X_2[\text{DFT}] = [2, 3-j, 0, 3+j]$$